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ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION

**Effects of Wildfire on Elk and Deer Use
of a Ponderosa Pine Forest**William H. Kruse¹

After a wildfire, elk use shifted from an old seeded clearcut to a newly seeded burn for the first 2 years. The third year showed an equalizing trend of elk use between the two habitat conditions. The trend of decreasing deer use on thinned areas continued, but use increased substantially on the wildfire area.

Keywords: Forest fire effects, habitat (wildlife), deer, elk.

A lightning strike caused a wildfire in May 1967 which burned 350 acres of ponderosa pine² forest on the Wild Bill Range Study area north of Flagstaff, Arizona (fig. 1). Since prefire use data on thinned, clearcut, and seeded clearcut areas were available (Pearson 1968), the opportunity was provided to compare elk and deer response to new conditions created by the wildfire. The elongated burned area was sufficiently narrow to be considered a "forest opening," known to be preferred by elk and deer (Reynolds 1966).

Study Area

The Wild Bill study was designed to evaluate the effect of ponderosa pine density on forage and beef production in north-central Arizona (Pearson and Jameson 1967). The study area, located 13 miles northwest of Flagstaff on the Coconino National Forest, covers approximately 1,100 acres. The elevation varies from 7,400 feet

to over 7,800 feet. Average annual precipitation is approximately 23 inches.

The original treatments, which began in 1962, established seven Range Units—two clearcut pastures, one of which was seeded; four pastures thinned to basal area levels ranging from 20 to 80 square feet; and a native pasture as a control. Range Unit 8, a second control, was established in 1967 after the fire.

The major native grasses on the area include Arizona fescue, mountain muhly, bottlebrush squirreltail, and a sedge. Some of the more dominant forbs include fleabane, thistle, western yarrow, and senecio. Fendler ceanothus is the only browse species on the area. At the onset of the study in 1962, one of the clearcut units (Range Unit 1) was seeded with crested wheatgrass, intermediate wheatgrass, and yellow sweetclover. Vegetation in all other units was left native until after the fire in May 1967.

The hot crown fire, which decimated the standing forest and burned herbaceous cover and litter to mineral soil, was confined primarily to the Holding Pasture, Range Unit 7, and the south edge of Range Unit 3. Because of earlier thinning treatments in Range Unit 3, the lack of fuel restricted the crown fire to the edge of that Unit. A 6-pound-per-acre seed mix, consisting primarily of orchardgrass with lesser amounts of several wheatgrasses and yellow sweetclover, was broadcast by helicopter over

¹Range Research Technician, located at the Station's Forestry Sciences Laboratory at Flagstaff in cooperation with Northern Arizona University; Station's central headquarters is maintained at Fort Collins in cooperation with Colorado State University.

²Common and botanical names of plants mentioned are listed at the end of the Note.

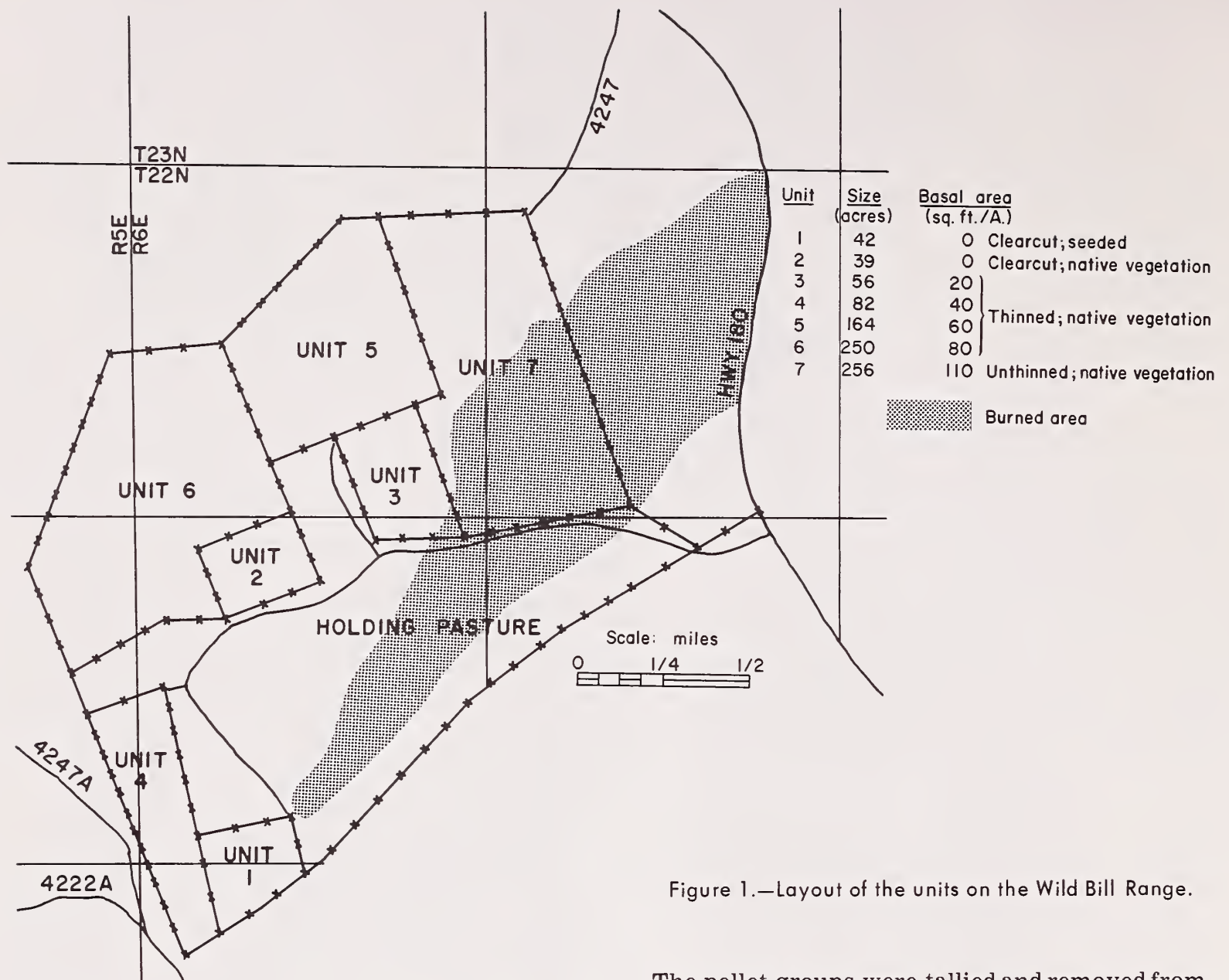


Figure 1.—Layout of the units on the Wild Bill Range.

the entire burned area in July 1967 just prior to the summer rains. Cattle grazing was deferred on the burned units for 2 years following the seeding.

Average forage production on the burned portion of Range Unit 7 for the 5 years prior to the fire and for 3 years following was:

	Prefire	Postfire
	(Pounds per acre)	
Grasses	45	395
Forbs	12	532
Shrubs	>1	56

Use Measurements

Elk and deer pellet groups were sampled on 15 clusters in each of the Range Units. Each cluster consisted of three circular 0.01-acre plots.

The pellet groups were tallied and removed from the plots in November of each year. Forage production was also estimated each year. Since 1969, a weight-estimate method was used to make these determinations (Pechanec and Pickford 1937). Prior to 1969, a paired-plot procedure was used to determine utilization by cattle periodically during the grazing period. Yearly production figures were calculated from these data and residue figures.

Pellet groups were counted annually in 1968, 1969, and 1970. One hundred and thirteen 0.01-acre temporary plots (Neff 1968) were examined on four transects running the length of the burn in the Holding Pasture. The plots were spaced approximately 50 yards apart along the transects (fig. 1). Pellet groups dropped prior to the fire were burned. The count made in 1969 represented a 2-year accumulation, and the count in 1970 represented a 3-year accumulation. Annual pellet group increment was determined by subtracting previous counts from the current total accumulation.

Forage production and utilization were not measured in the Holding Pasture.

Results and Discussion

Elk Observations

During the prefire years following the original treatments, elk use was declining in most of the units except in seeded clearcut Unit 1, which showed the greatest amount of elk activity (table 1). After the 1967 fire, elk grazing on the seeded clearcut was reduced as use shifted to the burned area. The first and second years after the fire, pellet groups on the seeded clearcut showed a considerable reduction from preburn counts.

The pellet group densities in the burn reached peaks similar to those previously attained in the seeded clearcut. The third year (1970) showed a decrease in elk pellet counts on the burned areas, but an increase again in the seeded clearcut. A similar early peak of elk use on newly seeded areas was documented by pellet group counts taken on the Beaver Creek Pilot Watershed 11;³ after the initial response, elk concentrations declined somewhat, but continued high use indicated a preference for seeded areas (Wallmo 1964).

³Unpublished data, Rocky Mountain Forest and Range Experiment Station and Arizona Game and Fish Department.

Reinstated cattle grazing on the burned areas possibly influenced this decrease on Wild Bill. Similar observations were reported by researchers in Oregon (Skovlin, Edgerton, and Harris 1968) and in California on tule elk (McCullough 1969). During the 2 years that grazing was not permitted on the burn (1967 to 1968), elk were observed from time to time, as were fresh tracks and pellet droppings in the burn itself, and numerous rubbing trees in timbered areas along the edge of the burn. These indicators were not obvious during the summer in years prior to the fire, nor in the years succeeding the reinstatement of cattle.

Deer Observations

After the fire, deer pellet groups increased in the burned areas (table 1). As with the elk, sightings of deer became more numerous in 1968 and 1969 before cattle were allowed to return to the newly seeded areas. In 1970 after cattle grazing had been reinstated, deer were still seen in these areas, but not with the consistency of the previous 2 years.

Observations since the wildfire indicate an improved habitat for deer. This is consistent with other studies of prescribed and wildfire burning of deer habitats, especially where browse species increased (McCulloch 1969, Vogel and Beck 1970).

Table 1.--Yearly elk and deer pellet groups per acre, 1964-70

Range unit and treatment	Elk pellet groups							Deer pellet groups						
	1964	1965	1966	¹ 1967	1968	1969	1970	1964	1965	1966	¹ 1967	1968	1969	1970
	----- <u>Number</u> -----													
CLEARCUT:														
1 Seeded	27	64	13	51	2	4	22	16	7	7	2	0	2	4
2 Native	9	2	3	0	4	0	--	42	11	11	0	7	0	--
THINNED:														
3 20 Basal area	7	9	2	0	--	0	--	4	13	2	9	--	0	--
4 40 Basal area	13	4	2	0	0	0	--	124	31	2	2	0	0	--
5 60 Basal area	7	11	2	0	0	0	--	36	33	2	0	2	0	--
6 80 Basal area	4	4	4	0	0	0	--	33	0	0	2	4	0	--
UNTHINNED:														
7	0	0	0	0	37	52	11	18	4	0	0	11	26	67
8	--	--	--	0	2	0	0	--	--	--	0	2	0	0
HOLDING PASTURE	--	--	--	--	19	72	30	--	--	--	--	4	0	11

¹The wildfire in 1967 severely affected portions of Unit 7 and the Holding Pasture. Postfire pellet group counts are reported only for the burned portion of these units. Unit 3 was only slightly affected.

Burned areas on Wild Bill showed a steady increase in numbers of pellet groups per acre in the 3 years following the fire, while no important increase in deer pellet groups was observed in any of the other range units.

Summary and Conclusions

Annual pellet count data on the Wild Bill Range indicate that forest openings, created by wildfire and followed by seeding, are just as attractive to elk as are open habitat conditions created by clearcut and seeding methods. Elk use on the burned areas was higher than on the thinned or clearcut areas for 2 years following the fire. Increased elk sightings during the summer and fall indicated a shift away from spring use patterns to season-long use on the newly seeded burn.

Elk use peaked and then fell off in the years following the original treatments. Use on the native (unseeded) clearcut area was lower than on the seeded areas, but showed more year-to-year stability than use on the thinned areas.

Prefire pellet group counts show a yearly decline in deer use on most of the treated areas. Deer use increased on the seeded wildfire opening, however.

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Common and Botanical Names of Plants Mentioned

Ceanothus, Fendler	<i>Ceanothus fendleri</i> Gray
Fescue, Arizona	<i>Festuca arizonica</i> Vasey
Fleabane	<i>Erigeron</i> sp.
Muhly, mountain	<i>Muhlenbergia montana</i> (Nutt.) Hitchc.
Orchardgrass	<i>Dactylis glomerata</i> L.
Pine, ponderosa	<i>Pinus ponderosa</i> Laws.
Sedge	<i>Carex geophila</i> Mackenz.
Senecio	<i>Senecio</i> sp.
Squirreltail, bottlebrush	<i>Sitanion hystrix</i> (Nutt.) J. G. Smith
Sweetclover, yellow	<i>Melilotus officinalis</i> (L.) Lam.
Thistle	<i>Cirsium</i> sp.
Wheatgrass, crested	<i>Agropyron cristatum</i> (L.) Gaertn.
Wheatgrass, intermediate	<i>Agropyron intermedium</i> (Host.) Beauv.
Yarrow, western	<i>Achillea lanulosa</i> Nutt.